RESEARCH STATEMENT

November 3, 2005

Vyacheslav Krutelyov
Physics Department, Texas A& M University, College Station, Texas 77843-4242

With the statement to follow I would like to address my interest to pursuing the search for the new, undiscovered yet or the long sought for characteristics of matter that can be discovered with the existing or planned high energy physics facilities. I would focus this statement with a bias to the high energy collider experiments which I would like to continue to work on.

In the collider experiments, there are nominally two ways to search for New Physics. One is to search for the direct production of the new particles expected to happen very rarely. The other is to search for the decays of some copiously produced particles, the decays which are either prohibited or highly suppressed in the Standard Model (SM). I have pursued both ways of doing that up to the journal paper level.

The first approach, a search for production of supersymmetric partners of quarks (squarks) and gluons (gluinos). The squarks and gluinos should decay in cascades into the LSPs, this way producing multiple jets of particles in the detector plus the missing energy due to the undetectable LSP. We proposed to search for the SUSY in the events that have the jets and the missing energy. This study was performed at the Monte Carlo level as a part of research and design effort for the Tevatron Tripler, an upgrade to the Tevatron accelerator to triple the energy of the colliding particles, proposed by the Texas A&M group. This analysis is published in Phys. Lett. B **505**, 161 (2001).

The second approach, a search for supersymmetry using rare decay of a B_s meson to two muons, is the base for my PhD thesis. While the branching ratio of $B_s^0 \to \mu^+\mu^-$ decays in the SM is only about 4×10^{-9}, some attractive SUSY models predict a much higher rate specifically for the B_s meson to two muons decay, in fact, this decay is considered as one of the most promising to search for SUSY. Based on the data collected by CDF between 2002 and 2004 we are able to set a limit which is a factor of 2 better than the best world's limit. This result is accepted for publication by Phys. Rev. Lett. (hep-ex/0508036). Note that an intermediate result by CDF using data between 2002 and 2003, the analysis I also took part in, was also published in Phys. Rev. Lett. **93**, 032001 (2004) and is currently the second most cited of the CDF/DØ Run II publications. This allows for eliminating some of the theoretically interesting SUSY models. Which is also exciting is that in setting the upper limit for a very similar $B_d^0 \to \mu^+\mu^-$ decay at the CDF we can do better than the existing B-factories.

As a member of the CDF collaboration, the Texas A&M group has also been involved in various detector support and development projects that I was also a part of. These include the following: EMtiming project, a CDF hardware upgrade needed to measure the time of flight of the particles from the collision point, for which I have played a significant role in testing and improving the electronics including the checkout, installation procedure, and repairs. On-line physics monitoring, ObjectMon project, where I have performed an extensive software programming, and lead the support of the project for more than a year; this also includes several improvements to the major parts of the CDF on-line monitoring. Muon offline reconstruction project, which includes my main software contribution to the collaboration – coding validation and support of the crucial tool in the muon reconstruction, the extrapolator.

In addition, I have played the leading role in managing the Texas A&M group computing resources at Fermilab. With resources provided by the Texas A&M group funding, I have built the computer cluster for data storage, analysis, and then performed the system administration since then (since 2001).

While being a graduate student with Texas A&M my objectives were to perform with the highest quality in the research field I was doing at the time. I have pursued to get a broad view of the performed research, this includes a number of special topic courses in the degree plan covering the theoretical aspect of the research (this includes quantum field theory, astrophysics, general relativity, and quantum gravity). This is to add to mastering the complicated analysis tools and attaining the expertise in the detector hardware, software, and operations. I have also paid an extensive attention to the research performed by my colleagues, not limiting myself to the personal research field.

In the plan for a postdoctoral research position I would like to be involved in the work that is balanced between data analysis for the physics measurements and the detector design/support (hardware or software). Although, a clear bias to the data analysis is expected, the involvement in the hardware or software projects is needed. I also look forward to working in a group possibly playing a leading role in an analysis or (a part of) a detector hardware/software project.